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URANIUM AND THORIUM MINERALIZATION OF THE NORTHERN HALF OF THE HORSESHOE MOUNTAIN QUADRANGLE, NELSON COUNTY, VIRGINIA

William Mark Bailey[1]

The Horseshoe Mountain quadrangle is located within the Blue Ridge Physiographic Province of central Virginia (Figure 1). The study area is the northern half of the quadrangle and is part of the Roseland titanium mining district. The area is mountainous with relief ranging from about 3000 to 1200 feet.

Two major mappable associations recognized are: 1) massive or gneissic textured rocks which retain evidence of a primary granulite to amphibolite facies mineralogy, and 2) ductilely deformed, mylonitic rocks which possess a retrograde greenschist mineralogy and were derived from association 1.

Rock units have been grouped into six broad categories for this report: 1) massive charnockites; 2) mylonitic biotite gneisses and schists; 3) granulite gneisses; 4) mylonitic actinolite schist; 5) feldspathic mylonite; and 6) mylonitic chlorite uralite gneiss (Figure 2). Units 1 and 3 retain Grenville age or older texture and relic mineralogy while units 2, 4, 5, and 6 have Paleozoic mylonitic fabric and mineralogy. The purpose of this report is to present the extent and lithologic distribution of uranium and thorium mineralization in the study area.

Ductile deformation and retrograde greenschist facies metamorphism, associated with formation of the Rockfish Valley ductile deformation zone (DDZ), affected large portions of the study area (Figure 2). Bartholomew and others (1981) suggest a middle to late Paleozoic age for this event in central Virginia, based on isotopic studies conducted elsewhere (Dietrich, 1959, Dietrich and others, 1969; and Robinson, 1976).

Total intensity (U, Th, K) aeroradiometric contour maps (Virginia Division of Mineral Resources, 1976) for the Horseshoe Mountain quadrangle suggest that particular areas within the Rockfish Valley DDZ have anomalously high

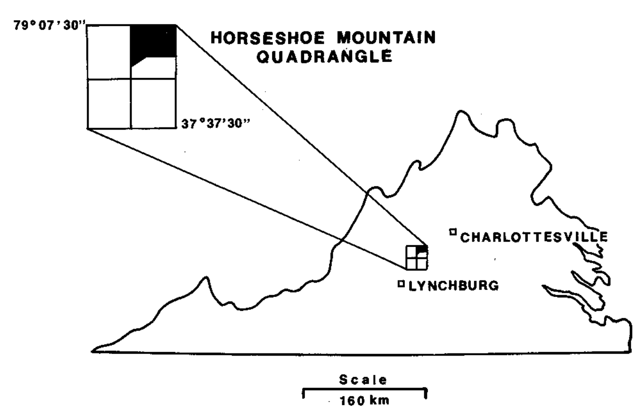

Figure 1. Location of the study area and the Horseshoe Mountain quadrangle.

[1]Present address: EXXON Co. U.S.A., Lafayette, LA 70505.

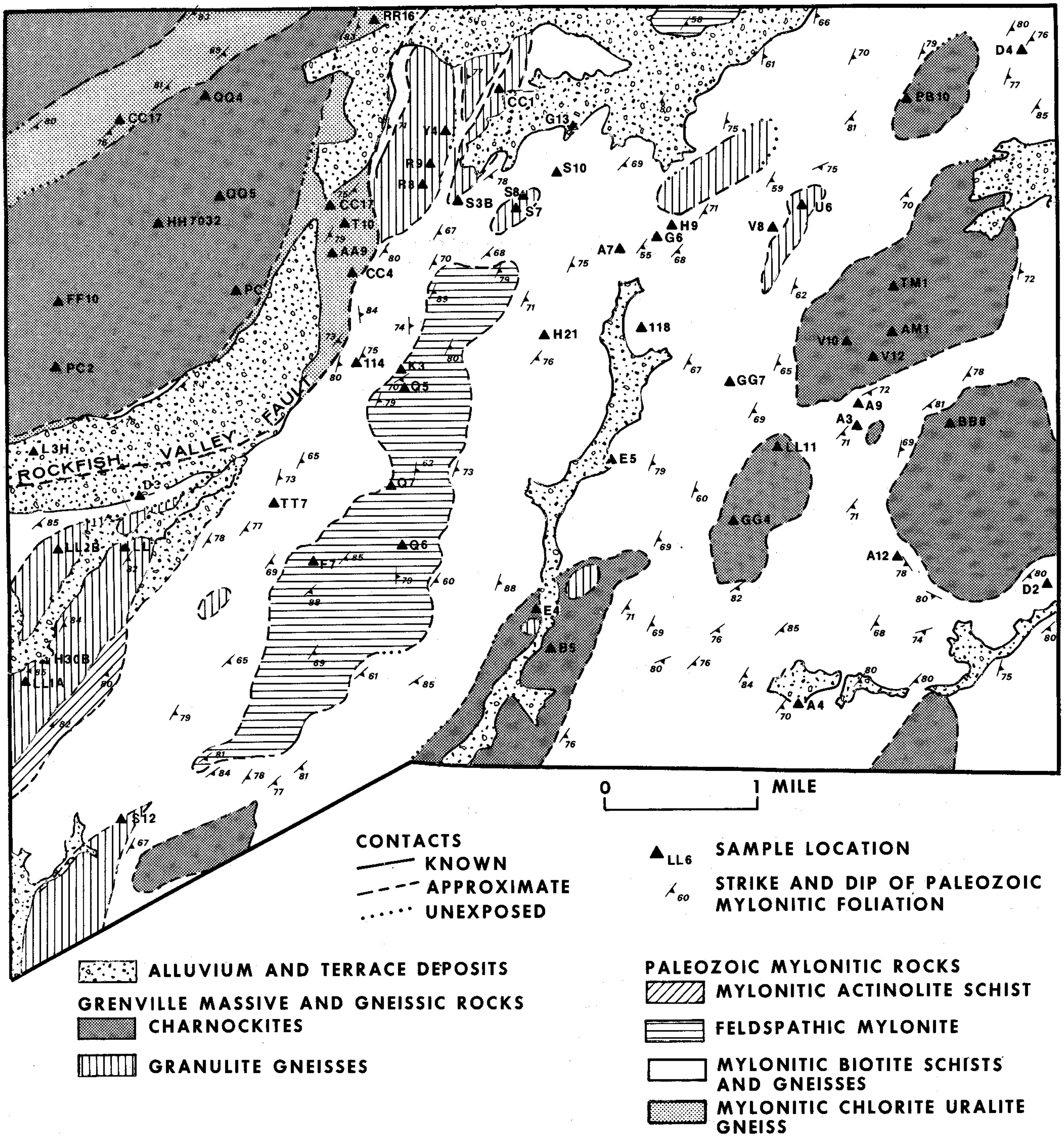

Figure 2. Sample locations for petrographic and whole rock analyses and generalized geology of the northern part of the Horseshoe Mountain quadrangle (modified after Bailey, 1983).

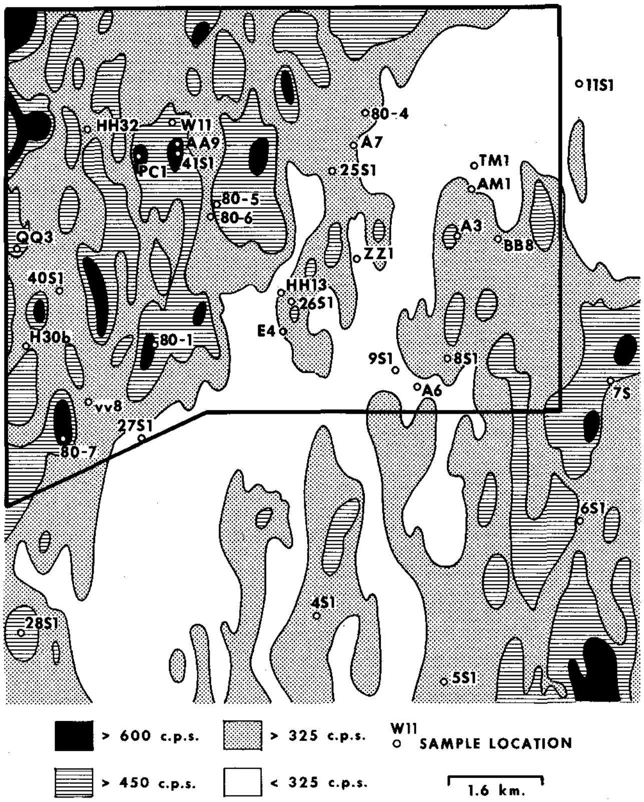

Figure 3. Total intensity U, Th, and K aeroradiometric anomaly map (Virginia Division of Mineral Resources, 1976)

U and Th concentrations (Figure 3). Most of these anomalies were checked in the field with a standard gamma ray scintillometer. Only anomalies associated with the granulite gneisses and the feldspathic mylonite possess recognizable radiometric signatures (30,000 - 80,000 counts per second) much higher than background radiation of 5,000 - 10,000 counts per second. Most samples analyzed from these and other anomalies (AA9, E4, HH13, H-30b, A3, and PC1) do not possess unusual concentrations of U and Th (Table 1 and Figure 2) and are consistent with or below average crustal abundances (in ppm) of 2.7 U, 9.6 Th, and a Th/U value of 3.6 (Heier and Thoreson, 1970). One sample (VV8) possesses an anomalous high Th concentration of 60.2 ppm.

Uranium and thorium whole-rock analyses were performed by J. Spalding at the University of Georgia Center for Applied Isotope Studies on all major rock types in the study area (16 samples) to determine lithologic and structural distribution patterns for these elements. U (radium equivalent) and Th abundances were determined by gamma ray spectroscopy, analyzing 600 gms of crushed rock on a Canberra Series 80 multichannel analyzer

Table 1. U, Th and rare earth whole-rock analyses of major lithologies in study area. Samples AH-80-1, 4, 5, 6, and 7 from Ames (1981). Average crustal abundance from Heier and Thoreson (1970). Abundances are in ppms.

	U	Th	Th/U	La	Ce	Nd
Country Rock Gneiss						
AH-80-1 (felds gneiss)	0.0	1.1	—	252	52	144
AH-80-4 (Hills Mtn)	0.0	1.5	—	180	294	336
AH-80-5 (felds mylo)	1.8	6.2	3.4	313	206	100
AH-80-6 (felds mylo)	15.3	275	18.0	2059	1355	600
AH-80-7 (felds mylo)	7.3	135	18.5	2089	1010	975
E4 (layrd qtz gr gn)	0.0	0.8	—			
H-30b (hbl equ gn)	0.0	15.7	—			
VV8 (felds mylo)	2.5	60.2	24.1			
ZZ1 (myl bio mus gn)	0.0	1.0	—			
AA9 (myl bio mus gn)	0.0	1.6	—			
HH13 (felds mylo)	0.0	0.9	—			
Roses Mill Complex						
A3 (granitic gneiss)	0.0	1.5	—			
A7 (myl bio augen gn)	0.0	2.1	—			
A6 (myl bio augen sch)	0.0	2.0	—			
AM1 (charnockite)	0.0	1.2	—			
TM1 (charnockite)	0.0	2.2	—			
BB8 (charnockite)	0.0	2.1	—			
Pedlar River Pluton						
HH32 (charnockite)	0.0	3.8	—			
PC1 (charnockite)	0.0	4.6	—			
QQ3 (myl chl ura gn)	0.0	2.8	—			
W11 (blastomylonite)	1.6	5.3	3.3			
Average Crustal Abundance	2.7	9.6	3.6			

with a Ge (Li) ray detector. Whole rock rare earth analyses were determined using X-ray fluoresence spectrometry (Ames, 1981). Table 1 summarizes results from all analyses.

Ames (1981) analyzed five samples of sheared leucocratic granulite (feldspathic mylonite of this study) from the study area which possessed anomalous concentrations of 15.3 ppm U; 275 ppm Th; and 7.33 ppm U; and 135 ppm Th (samples AH-80-6 and 7). These samples were also obtained from aeroradiometric anomalies within the Rockfish Valley DDZ (Figure 3).

Heavy mineral stream sediment analyses for U. Th, La (Cook, 1981) and other elements are presented in Table 2. Analyses were performed by automated neutron activation analysis (NAA). Sample locations for all whole rock and heavy mineral analyses are presented in Figure 3.

DATA INTERPRETATION

The anomalous high concentrations (compared to average crustal values) of Th in feldspathic mylonite samples VV8, AH-80-6, and AH-80-7 and U in samples AH-80-6 and AH-80-7 suggest that these elements were enriched in these rocks at some point in their history. The high Th/U values of 24.1, 18.0, and 18.5 for samples VV8, AH-80-6, and AH-80-7, respectively, indicate that Th enrichment was much greater than U enrichment.

The U and Th abundances of these samples seem to be directly related to their structural state and mineralogy. Only the feldspathic mylonitic gneisses and schists which are intensely sheared and occur within the DDZ have anomalous concentrations of these elements. U and Th concentrations favor the intensely sheared feldspathic mylonitic over their unsheared granulite gneiss equivalents (Table 1).

U and La values do not display a consistent relationship which suggests that rare earth minerals, such as monazite, are not the principal source of U. U and Th abundances determined from heavy mineral analyses (Table 2) do not appear directly related to their proximity to high total intensity aerorad anomalies. The high U but generally low Th abundances (below average Th/U value) in most samples (VANE005S1), 7Si, 9S1, 25S1, 16S1, 26S1, 40S1) suggest that these elements are probably concentrated in a mineral with high U, low Th content, such as zircon. Zircons with high U and very low Th/U values of approximately 0.39 (average of four samples) have been analyzed from the area (Herz and Force, in press). Th-bearing minerals present in Th enriched hard rock samples VV8, Ah-80-6, and 7 are apparently broken down in streams since abundant Th is not retained in the heavy mineral analyses.

URANIUM AND THORIUM DISTRIBUTION MECHANISMS

Thin section analysis of feldspathic mylonite samples AH-80-6, AH-80-7, and VV8 did not reveal any obvious Th or U bearing minerals (except zircon) that would explain the anomalous concentrations in these rocks. Some U and Th would be expected in apatite, sphene, epidote, and zircon which are common accessory and trace minerals in these rocks. Much of the Th and U may occur in interstitial material along grain boundaries as has been reported from some granitic rocks of Wyoming (Taylor, 1965). Further analytical work (autoradiography) is needed before the position of anomalous Th concentrations in feldspathic mylonite can be determined.

Table 2. Heavy mineral stream sediment analyses (Cook, 1981). Abundances are in ppms; m=missing data (See Figure 3 for sample locations).

Sample	U	Th	Th/U	Fe	Ti	La
VANE004S1	5.6	m	—	54100	9500	80
VANE005S1	42.9	13	.30	73500	36100	70
VANE006S1	5.0	m	—	53700	8000	51
VANE007S1	6.1	6	.38	54800	8600	75
VANE008S1	m	m	—	78900	17300	95
VANE009S1	3.4	2	.59	74100	6000	110
VANE011S1	1.1	m	—	52500	11100	40
VANE025S1	13.3	11	.83	48400	9000	58
VANE026S1	10.3	13	1.26	48800	20100	50
VANE027S1	13.2	23	1.74	56500	26500	62
VANE028S1	15.5	42	2.71	114900	66200	87
VANE040S1	8.6	21	2.44	91800	9000	82
VANE041S1	1.2	5	4.17	44900	10500	37

Anomalously elevated U content, as well as economic U deposits are commonly associated with leucocratic feldspathic igneous rocks found in ductile shear and fault zones (Stuckless and Nkomo, 1978; Ryan, 1979; Watson and Plant, 1979).

Ames (1981) uses the following explanation for anomalous Th and U abundances in mylonitic feldspathic granulites from the study area. Dehydration and partial melting during granulite facies metamorphism produced melts enriched in U, Th, and light REE. These melts were emplaced into a granulite facies terrane, metamorphosed, and deformed producing feldspathic granulite gneisses. Paleozoic ductile shearing created channels through which surface derived fluids could pass, allowing leaching of U, Th, and light REE from the enriched rocks and concentrating them in the highly fractured and feldspathic rocks of the DDZ. This event may have been preceded by an earlier metamorphic and ductile event which included late Precambrian granitic plutonism.

Late stage U and Th enriched magmatic fluids from granitic plutons may have provided a source for the anomalous U and Th concentrations in the area. Such fluids may have been incorporated into the active Paleozoic ductile mylonitic shear zones and then preferentially redistributed into the more feldspathic lithologies which are generally more fractured. Several Late Precambrian to Paleozoic aged granitic plutons occur in the immediate vicinity of the study area including the Mobley Mountain pluton (Herz and others, in press).

Baillieul and Daddazio (1981) report U and Th mineralization in shear zones of the Lovingston Formation near Charlottesville in central Virginia, 30-70 miles northeast of the study area. Assays of weathered rock and saprolite there indicate a maximum of 4800 ppm U and 5 percent Th with minor La, Nb, F, Sc, Sn, Ti, V, W, Y, and Zn. Principal radioactive minerals are uranothorite, monazite, and thorogummite occurring with pyrite in the most radioactive rocks. Mineralization is attributed to magmatic fluids enriched in U and Th during late stage magmatic differentiation in granitic plutons emplaced to the east.

ECONOMIC POTENTIAL

U potential in the area is probably not favorable because the element appears to be principally tied up in high U zircon. However, fractured feldspathic mylonitic gneiss lithologies with high Th abundances provide an interesting exploration target. Th is greatly enriched over U in these rocks. To adequately determine the economic potential of these rocks, further work must be conducted within the DDZ. Emphasis should be placed on determining the nature and selective distribution of Th mineralization. Aerorad anomaly maps and hand held gamma ray scintillometer are essential tools. Samples for analysis should be unweathered, described texturally, and should be numerous enough to completely cover anomalous areas. Autoradiographs are probably necessary to locate the Th carriers. Microprobe analysis or other techniques could then be used to identify mineral hosts. Heavy mineral analysis of stream sediments does not appear very effective in locating Th enriched hard rock exposures.

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CERTIFICATE AWARD

Stanley S. Johnson, chief geologist for the Virginia Division of Mineral Resources, was one of five persons receiving Presidential Merit Certificates from the American Institute of Professional Geologists. The certificates are presented to individuals who have made outstanding contributions to AIPG during the year. Mr. Johnson was honored at the Institute's Annual Meeting in Orlando, Florida, on October 19th, for his outstanding performance as 1984 President of AIPG's Virginia Section.

CHARACTERISTICS AND ECONOMIC POTENTIAL OF AN UPLAND FLUVIAL TERRACE, BUCKINGHAM COUNTY, VIRGINIA

William F. Giannini

Until recent years fluvial terraces were seldom indicated on geologic maps. Now such deposits are considered important in defining the geologic history of an area and in the search for valuable mineral resources. Examples of ancient river terraces occur along the James River in Buckingham County near Howardsville (Figure 1). In this area there are three distinct levels, herein called T_3, T_2, and T_1 (Figure 2). These terrace deposits overlie Triassic rocks of the Scottsville basin. The oldest and highest terrace (T_3), with its base at 515 feet above sea level, is 1.7 miles long, about 0.2 mile wide, is up to 45 feet thick, and is represented by five eroded and dissected remnants. The three smaller remnants of this once continuous high terrace preserve only the lowest 5 feet of the original deposit. The two larger remnants of the old high terrace, which are the main subject of this report, consist of about 20 feet of sand, silt, and clay overlying some 25 feet of boulders cobbles, pebbles, and some sand, silt and clay. Two younger terraces (T_1 and T_2) occur just below T_3 with base elevations at 330 feet and 420 feet respectively (Figure 3).

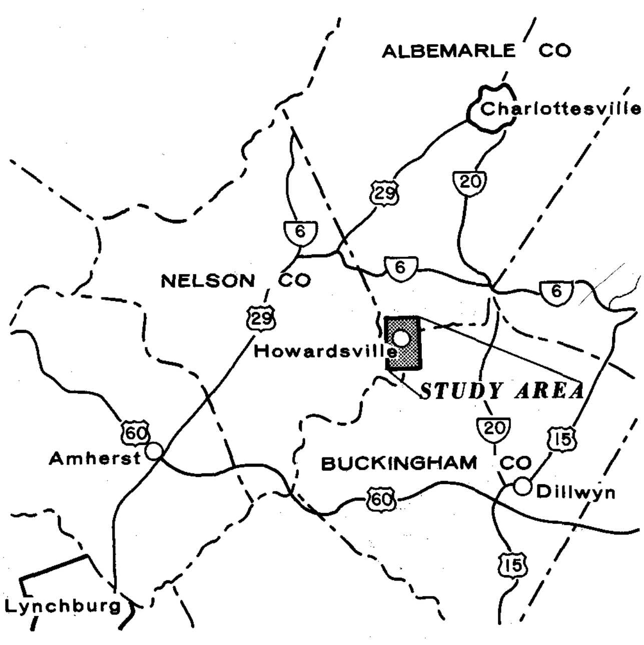

Figure 1. Location of upland fluvial terraces along the James River in Buckingham County.

UPPER TERRACE

Upper Portion

The upper 20 feet of the T_3 terrace was probably deposited as a broad point bar when the James River migrated by lateral corrasion to the northwest. This upper remnant presently reaches a maximum elevation of 560 feet. This portion of the old terrace is composed, from top to bottom, of 6 inches or less of organic material (O horizon), up to 18 inches of a yellowish gray A horizon soil (Rock Color Chart No. 5Y 7/2) composed predominantly of quartz silt and some sand. Below this soil is up to 18 feet of predominantly moderate-reddish-brown B horizon clay (color 10R 4/6) with minor mottlings of dark yellowish orange (color 10YR 6/6). This 20 feet of soil can be classified as Turbeville Series of the Ultisols Order, Typic Paleudult (Carter, 1981; Soil Survey Staff, 1975).

Tests on a composite sample of clay from six hand-augered holes from the B horizon were run by U. S. Bureau of Mines, Tuscaloosa Research Center, Alabama and indicate that the material is not suitable for structural clay products without an additive. The underlying Triassic shales may possibly serve as an additive for the terrace clay. Triassic shale (R-8626, Figure 2) was sampled about 1 mile southwest of T_3; fired results indicate a good firing range to produce structural clay products.

Minerals identified in the 18 feet of the B horizon, upper portion of T_3 terrace deposit, include quartz, ilmenite, rutile, anatase, zircon, hematite, garnet, kyanite, staurolite, and chlorite. Kaolinite is the dominant clay mineral, with minor montmorillonite, occurring in the B horizon. Magnetite, amphibole, and biotite have weathered to form the hematite which imparts a characteristic reddish brown color to the clay. Zircon is present predominantly as clear or pale red-purple crystals with adamantine luster. Metamict zircons are scarce.

Lower Portion

The lower 25 feet of T_3 is composed predominantly of boulder to sand-sized quartz with subordinate reddish-brown clay (II C horizon). Two trenches, designated A and B (Figure 2), each 8 feet deep, 10 feet long, and 2 feet wide were

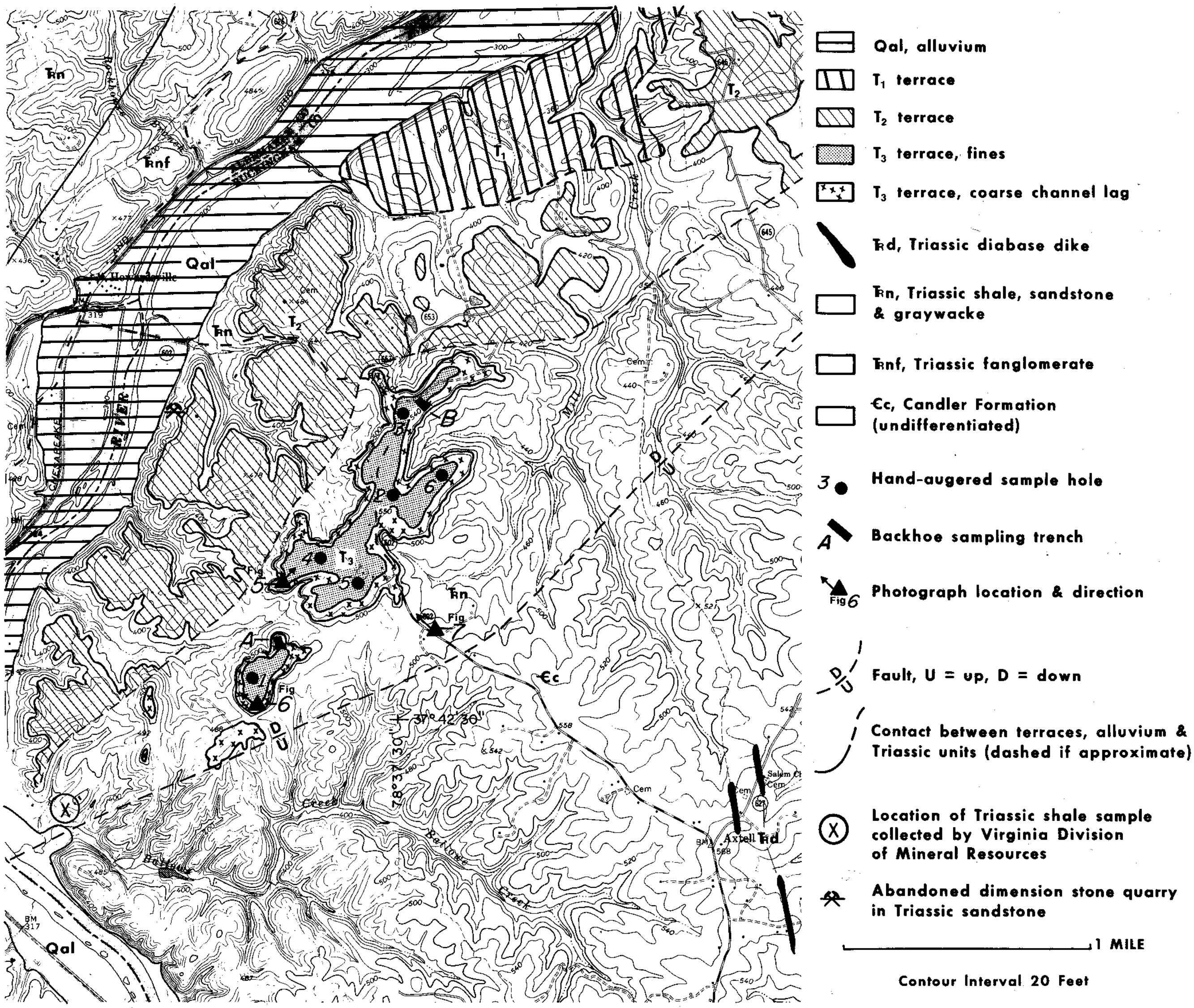

Figure 2. Location of T_1, T_2, and T_3 terraces. Base map compiled from Howardsville and Glenmore 7.5-minute topographic sheets.

excavated by backhoe into the lower, coarse channel-lag portion of the deposit. A composite sample from trench A contains 65.1 percent sand through cobble sizes and 34.9 percent silt through clay sizes. The sample from trench B indicates 61.1 percent sand through boulder sizes and 38.9 percent silt through clay sizes (Table 1). Surface examination of coarse channel-lag exposures of T_3 revealed the presence of blue quartz pebbles and cobbles, a pebble of tourmaline, variety dravite, one semianthracite coal pebble, and numerous ferruginous concretions formed by hematite cementing quartz grains (Figure 4). Some of these concretions were attached to quartz cobbles and pebbles indicating an in situ origin.

Table 1. Size distribution of samples from trenches A and B in the basal portion of T_3 terrace. Tests by Blue Ridge Analytical Laboratory, Inc., Charlottesville.

	TRENCH A SAMPLE	TRENCH B SAMPLE
Boulders	None	22.3%
Cobbles	14.8%	3.5%
Pebbles	22.8%	17.5%
Granules	3.4%	1.1%
Sand	24.1%	16.7%
Silt	6.8%	4.5%
Clay	28.1%	34.4%

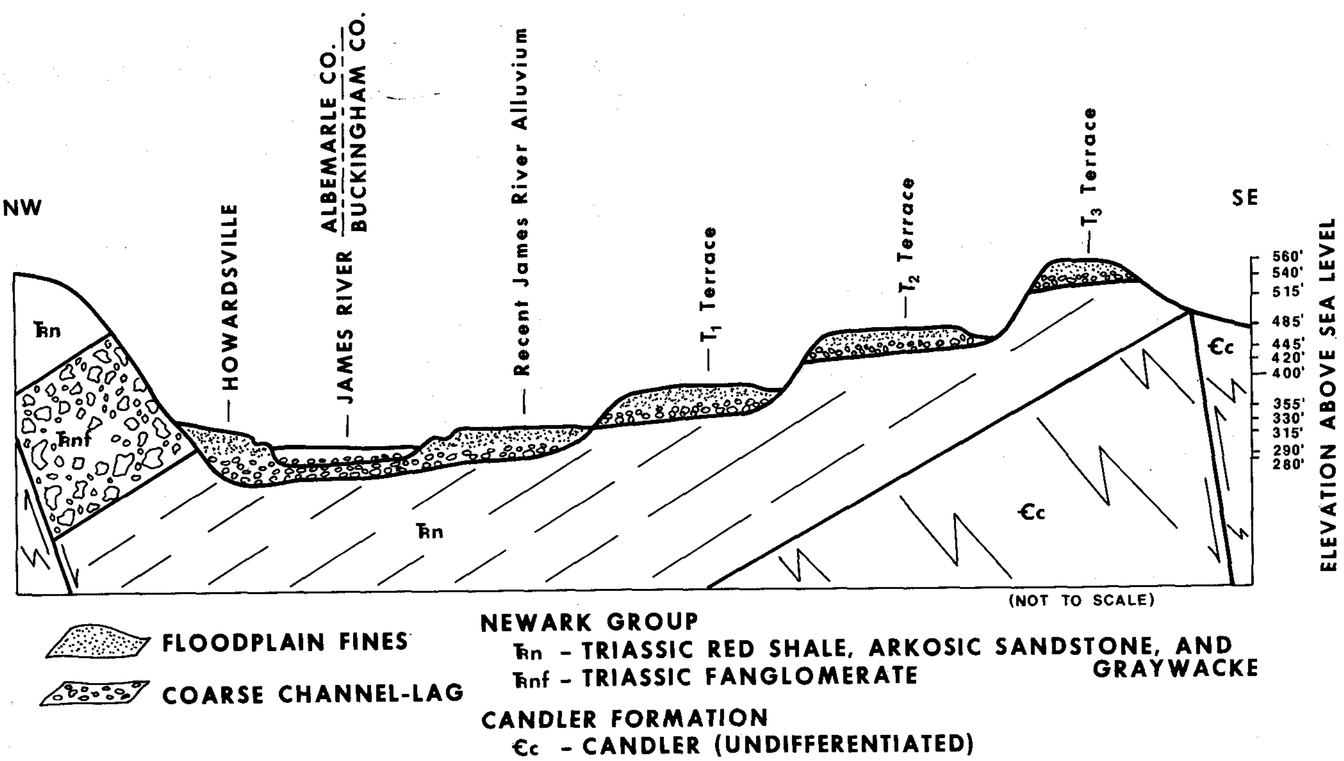

Figure 3. Cross section of fluvial terraces (T_1, T_2, and T_3). Terraces rest on rocks of the Scottsville Triassic basin. (280′ is the bottom elevation of the James River.)

Detection

T_3 can be recognized by the abundance of coarse, rounded, predominantly quartz rock or channel-lag deposits (Figure 5). T_3 exhibits a distinct, slightly undulating, almost horizontal bottom resting unconformably on Triassic red beds (Figure 6). The old terrace can be located on the Howardsville-Glenmore 7.5-minute topographic maps as prominences with relatively flat tops, similar maximum elevations, and steepening slopes (Figures 2 and 7). T_3 terrace is also detectable as a distinct low on a total intensity aeroradiometric map of the Buckingham 15-minute quadrangle. Radioactivity measurements were made on stations at fifty-foot intervals with a gamma-ray spectrometer along a traverse that extended across Triassic rocks and into a portion of T_3. The survey indicated that the relatively low radioactivity over the terrace is caused primarily by lower potassium-40 counts than in the surrounding Triassic rocks and secondarily by slightly lower counts for thorium and uranium. A comparison of the soil types and mineralogy of the surrounding Triassic rocks with those forming the T_3 terrace assists in identifying the deposit. Totier (old Bucks-Penn) soil occurs over the Triassic red beds and Turbeville series (old Hiwassee) cover the terrace (Carter, 1981; Wood, 1981). Soil types over the Triassic rocks in the area do not contain a II C horizon. This horizon is represented in the T_3 terrace by the coarse channel-lag portion forming the bottom 25 feet. The lack of magnetite in T_3 compared to an abundance of this mineral in the Triassic soil is a notable difference in the mineralogy of the two soil types.

ECONOMIC POTENTIAL

The average titanium (Ti) content of the upper 18 feet of T_3 terrace (B horizon) determined by tests on two whole-sample composites, each representing three hand-augered holes, is 1.40 percent Ti, or 4.44 percent ilmenite equivalent. Average zirconium (Zr) contained in the two composite samples is 0.075 percent or 0.15 percent zircon equivalent and the average aluminum expressed as $Al_2 0_3$ is 19.9 percent (Table 2). The amount of $Al_2 0_3$ contained within the clay does not qualify this deposit as a submarginal non-bauxitic aluminum source because a minimum content of 25 percent $Al_2 0_3$ is required for that designation (Staff, Bureau of Mines, 1967). Approximately 40,000 tons of ilmenite and 1,500 tons of zircon are contained in this upper portion of T_3. Ilmenite in this deposit is classified as a sedimentary, continental alluvium type deposit (Garner, 1978).

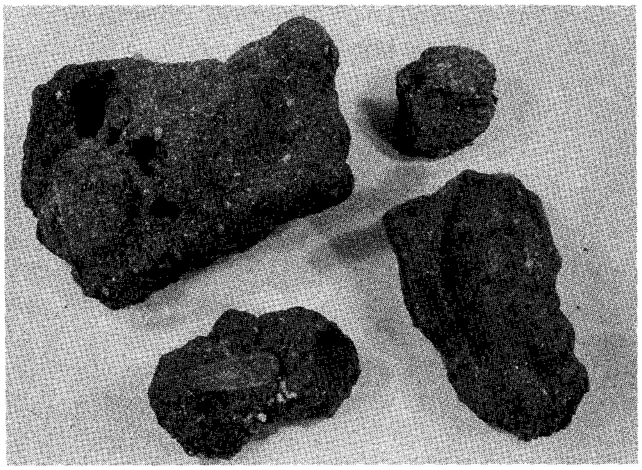

Figure 4. Concretions formed in situ by hematite cementing quartz grains within the T_3 terrace--actual size. Some concretions, are attached to cobbles and pebbles. (Photograph by T. Gathright)

Figure 5. Coarse channel-lag of boulder, cobbles, and pebbles indicate the basal portion of the T_3 terrace deposit.

Table 2. Summary of chemical tests on material from the T_3 terrace. Tests performed by the Virginia Division of Mineral Resources (VDMR) and Blue Ridge Analytical Laboratory, Inc. (BRAL).

Sample	Ti	[1]Ilmenite Equivalent	Zr	[2]Zircon Equivalent	Al_3O	SiO_2	Fe_2O_3	[3]Testing Laboratory
Hand Augered, Composite of Holes 1, 2, 3 (Fines)	1.37%	4.35%	.06%	.12%	21.5%	53.1%	11.5%	VDMR
Hand Augered, Composite of Holes 1, 2, 3 (Fines)	1.43%	4.53%	.07%	.14%	—	—	—	BRAL
Hand Augered, Composite of Holes 4, 5, 6 (Fines)	1.35%	4.27%	.07%	.14%	18.3%	46.3%	11.3%	VDMR
Hand Augered, Composite of Holes 4, 5, 6 (Fines)	1.45%	4.59%	.10%	.20%	—	—	—	BRAL
Backhoe Trench A, composite (Fines from channel lag)	.56%	1.77%	.07%	.14%	—	—	—	BRAL
Backhoe Trench B, composite (Fines from channel lag)	1.08%	3.42%	.03%	.06%	—	—	—	BRAL

[1]Ilmenite equivalent, $FeTiO_3$ = % Ti x 3.16806

[2]Zircon equivalent, $ZrSiO_4$ = % Zr x 2.00943

[3]All tests weight % and whole sample

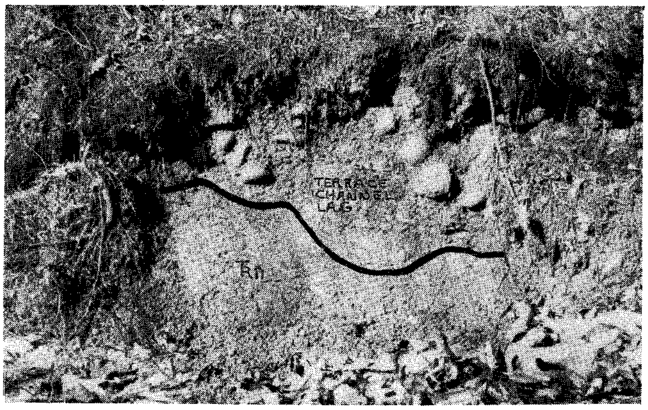

Figure 6. Bottom of the T_3 terrace resting on Triassic red shale TRn at 515 feet elevation.

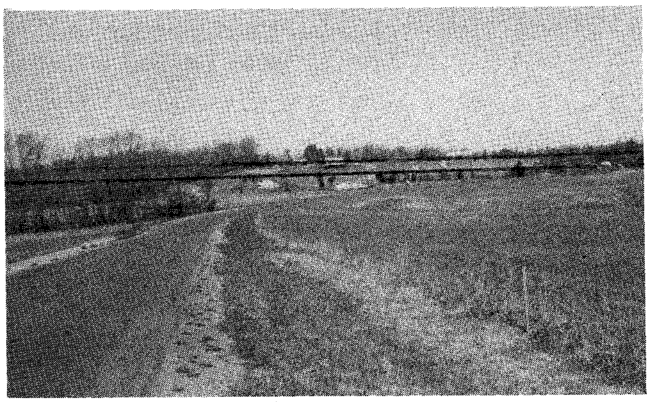

Figure 7. View northwest along State Road 602 approximately 1 mile southeast of intersection of Virginia roads 653 and 602. Lines indicate top and bottom of T_3 fluvial terrace.

Titanium (Ti) content in the sand, silt, and clay matrix of the coarse channel lag, or lower portion of T_3 terrace, is 0.56 percent or 1.77 percent ilmenite equivalent or approximately 72,000 tons. Zirconium (Zr) tested at 0.07 percent or 0.14 percent zircon equivalent or approximately 2,700 tons.

Terrace T_3 contains combined totals of approximately 112,000 tons of ilmenite equivalent, 4,200 tons of zircon equivalent, three million tons of quartz rock and sand and approximately 447,000 cubic yards of clay (Table 3). These quantities are probably too small to be considered for commercial development. The two more areally extensive younger terraces (T_1, T_2), which are known to contain titanium minerals and a greater abundance of clay, sand, and coarse quartz rock, may prove to be profitably mineable. In such a case, the development of T_3 for one or more commodities may be justified.

Table 3. Summary of materials with economic potential found in the T_3 terrace. Prices from: U.S. Bureau of Mines, Mineral Commodity Summaries, 1984.

	Ilmenite	Zircon	Sand and Gravel	Clay
Upper T_3	40,000 tons	1,500 tons		
Lower T_3	72,000 tons	2,700 tons	3 million tons ($3.00/ton)	447,000 cu. yds. (447,000 tons) ($5.00/ton)
Totals	112,000 tons ($57.00/ton)	4,200 tons ($165.00/ton)		

The major use of titanium metal in this country in 1983 was in jet engines, airframes, and space and missile applications (U. S. Bureau of Mines Staff, 1984). Zircon was used primarily in foundry sands and as a source for the byproduct hafnium, a metal used in naval nuclear reactors for control rods.

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MINERAL UPDATE: SPHALERITE FROM AMHERST COUNTY

D. Allen Penick[1]

The mineral sphalerite (zinc sulfide) has recently been discovered in the Dominion Stone quarry in Amherst County. The mineral had not been previously reported from the county. The quarry is operated by the Dominion Stone Plant, Inc. of Piney River, Virginia and is located in northern Amherst County about halfway between the communities of Lowesville and Piney River. The site is located on the Piney River 7.5-minute quadrangle and is situated 4,000 feet north of State Route 665 (Figure 1). The Piney River marks the boundary between Amherst and Nelson counties at this point. The quarry is situated in Amherst County while the plant and office is located across the river in Nelson County.

The company produces aplite mainly for use as a construction aggregate (roadstone, concrete, roofing chips, insulation products, and solar systems). The aplite from this locality is a fine grained light colored igneous rock composed primarily of plagioclase feldspar (albite) with smaller amounts of quartz and potash feldspar.

At the quarry sphalerite is closely associated with clinozoisite (epidote group), chalcopyrite, and pyrite. Galena was also observed in several specimens. The sphalerite occurs on fractures generally as black to brownish black lustrous cleavable masses up to 1 centimeter in length. Rarely tetrahedral crystals of sphalerite can be observed, but generally the mineral occurs as an open spaced filler and is controlled in size by spaces between clinozoisite blades. These dark lustrous minerals make attractive specimens against the light colored aplite and clinozoisite background (Figure 2). Sphalerite is the major ore of zinc, however it is rare in the quarry and can be considered of interest only to scientists and mineral collectors.

[1]Dr. R. S. Mitchell of the University of Virginia verified the mineral identifications by X-ray analysis.

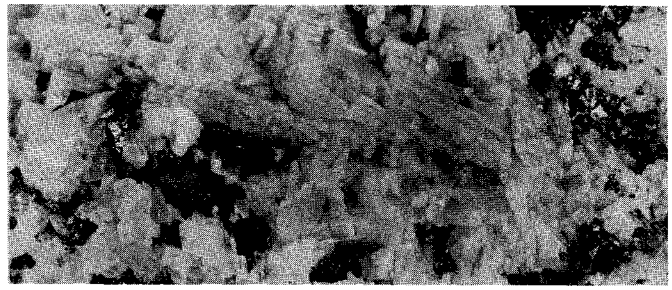

Figure 2. Close-up view of dark colored sphalerite associated with light colored, clinozoisite crystals. Photograph by T.M. Gathright, II. (Field of view is 2 inches.)

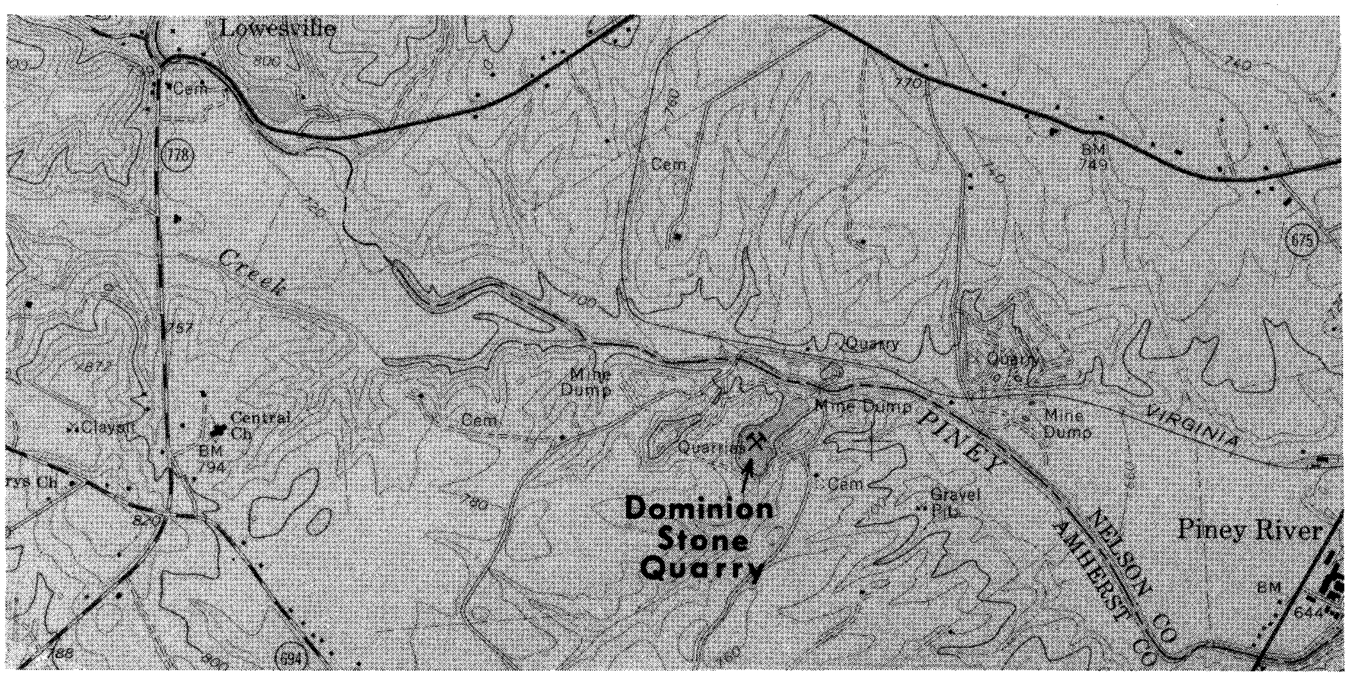

Figure 1. Location of the Dominion Stone quarry in Amherst County (1:24,000 scale).

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DAVID R. WONES

Dr. David R. Wones, 52, an internationally known professor of geology at Virginia Polytechnic Institute and State University died Thursday afternoon, October 25, 1984, as the result of a tragic automobile accident. Dr. Wones is survived by his wife, Connie Gilman Wones, and two sons and two daughters.

Dr. Wones was born in San Francisco, attended Punahou School in Honolulu and the Thomas Jefferson High School in San Antonio, and received his B.S. and Ph.D. degrees from the Massachusetts Institute of Technology. Before coming to Virginia Tech in 1977 he served on the faculty at M.I.T. and was a geologist and chief of the experimental geochemistry and mineralogy branch of the U.S. Geological Survey. At Virginia Tech he served as Chairman of the Department of Geological Sciences from 1980 until September 1984.

David Wones was recognized by his profession as a pre-eminent teacher and researcher in many areas of geology. He was considered by his colleagues, students, and faculty alike, as a true geologist in the broadest sense of the word. He served as Councilor of the Geochemical Society, Councilor and Secretary for the Geological Society of Washington, and Councilor and President of the Mineralogical Society of America. He served on the preliminary examination team for the Lunar Samples returned by the Apollo Astronauts and from 1972 to 1975 held a position on the Lunar Sample Review Panel. In 1979 he received the prestigious honor of being elected a Fellow of the American Geophysical Union.

David Wones was an active member in the Episcopal Church and served as vestryman at his churches in Lexington, Massachusetts; Bethesda, Maryland; and most recently at Christ Church in Blacksburg where he was a leader in the Mission Outreach Program. He was active for many years with the Boy Scouts and was a long-time member of the National Audubon Society.

NOTE ON QUATERNARY SYMPOSIUM

The Virginia Division of Mineral Resources recently held a symposium on the Quaternary of Virginia as one of its activities commemorating its 150th year. The meeting was held at Charlottesville on September 26-29 with a field trip to the famous vertebrate site at Saltville, which was known to Thomas Jefferson (see illustration). More than 100 people attended. The keynote address for the meeting, entitled "Thomas Jefferson and the Beginning of American Paleontology," was by Dr. Silvio Bedini of the National Museum of American History. In all, 24 papers and poster papers were presented by scholars from throughout the United States. Two field guides prepared for the meeting are available from the Division. A symposium volume and a separate paper by Dr. Bedini are being prepared for publication by the division. For more information contact S. O. Bird at the Division.

Some of the field trip group at the "dig" near Saltville. Dr. Jerry McDonald of Radford University, the field leader, is at far right. Photograph by S. Llyn Sharp of Virginia Polytechnic Institute and State University.